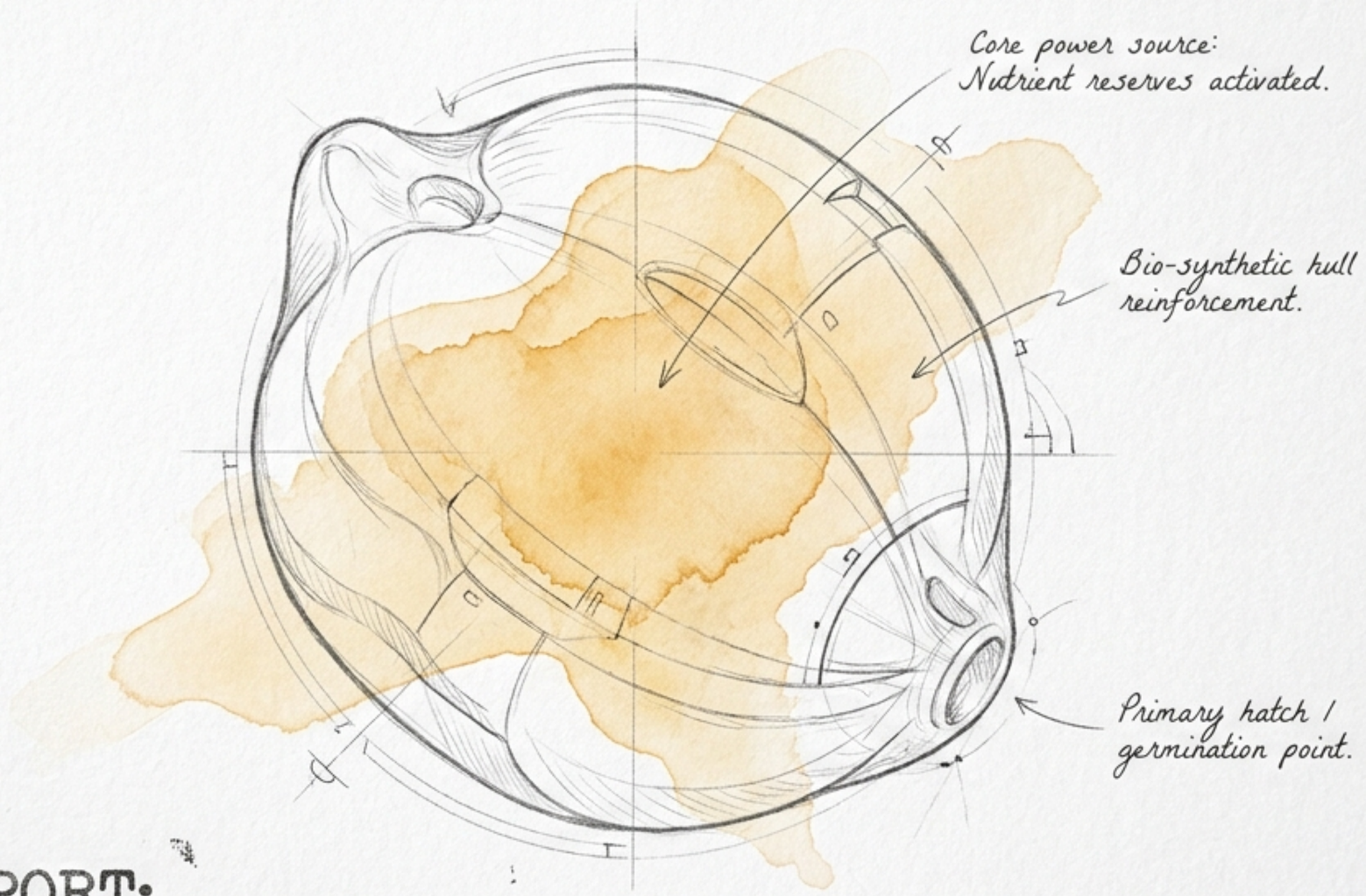

MISSION REPORT:
The Biological Spacecraft

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The Survival Pod Schematic

Component 2: The Pilot (Embryo)
Function: A tiny, folded-up plant ready to take manual control upon landing.

Plumule: The antenna / shoot

Component 1: The Outer Hull (Testa)
Function: A tough protective layer engineered to defend against drying out and microbial attacks.

Radicle: The landing gear / root

Component 3: The Fuel Reserves
Function: High-density stored energy to power the startup mission.

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Energy Storage Models for Different Missions

Double-Tank Model (Dicots)

Model: Chickpea (Chana)
Storage Mechanism: Food is stored in two large cotyledons.
Mission Profile: Engineered for the Cool Rabi Season (November).

Single-Tank Model (Monocots)

Model: Pearl Millet (Bajra)
Storage Mechanism: Food is packed into a separate endosperm.
Mission Profile: Engineered for the Hot Kharif Season (June).

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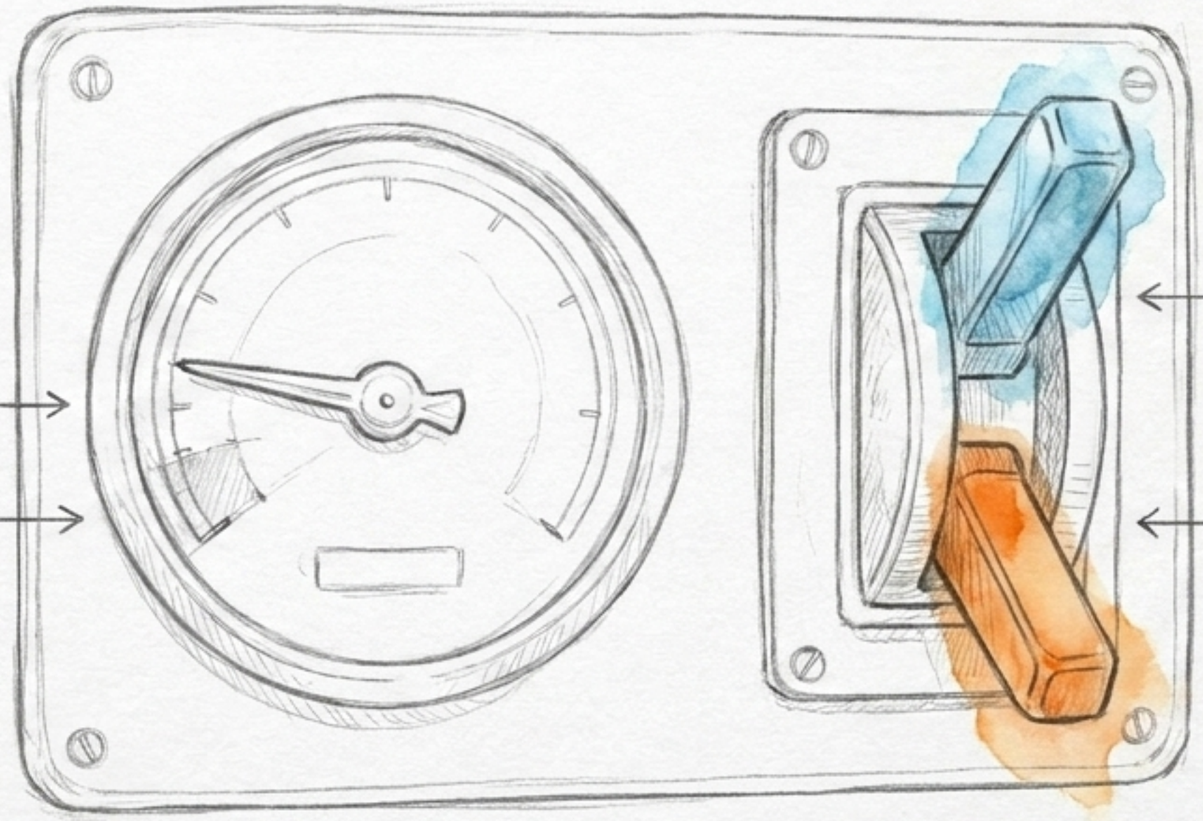
Quiescence and the Hormonal Control Switches

Metabolic Braking
Water levels are forcibly dropped from 90% down to just 10%.

The internal engine slows by thousands of times to survive the wait.



Switch 1: The "Stay Asleep" Lock
Powered by Abscisic Acid. Prevents the pilot from waking up during the wrong season.

Switch 2: The "Wake Up" Spring
Powered by Gibberellin. Triggers strictly when sensors detect perfect moisture and temperature.

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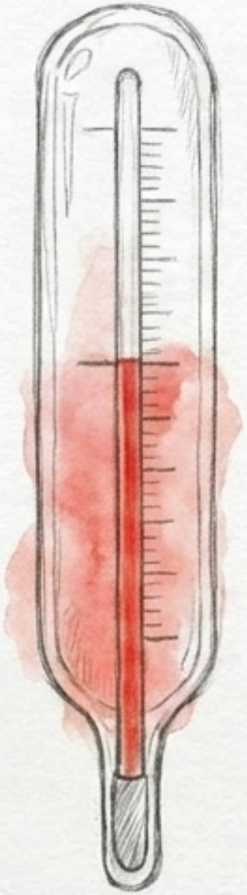
Calculating the Launch Window with Degree-Days

The Level-Up Rule: Plants must earn specific 'heat points' from daily weather to launch.



Points = Average Daily Temperature – Base Temperature

Mission Example: Chickpea Capsule

- Target: Needs exactly 60 Points to emerge.
- Daily Temp: 15°C (with a Base of 5°C) = 10 Points earned per day.
- Result: It will take exactly 6 Days to reach the surface.

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The 4-Stage Germination Sequence

Stage 1: Hydration (Imbibition)

The dry hull forcefully drinks water, generating hydraulic pressure strong enough to crack soil crusts and lift stones.

Stage 2: Systems Check (Activation)

The pilot begins breathing (respiration), burning its own stored fuel to power the startup.

Stage 3: Energy Conversion (Mobilization)

Special worker enzymes (Amylase) break down the hard fuel into mobile sugars the pilot can use.

Stage 4: Deployment (Establishment)

The Radicle deploys firmly downward into the soil; the Plumule reaches upward to catch the sun.

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Mission Controller Field Checks

Exercise 1: The Anatomy Audit

Task: Soak a Chickpea, peel the hull. Identify the Pilot and the Fuel Tanks.

Observation:

Exercise 2: The Survival Equation

Task: If a seed has 3 kJ of total energy and burns exactly 10% of it to start its engine, how much energy is left over to build its first leaf?

Calculation:

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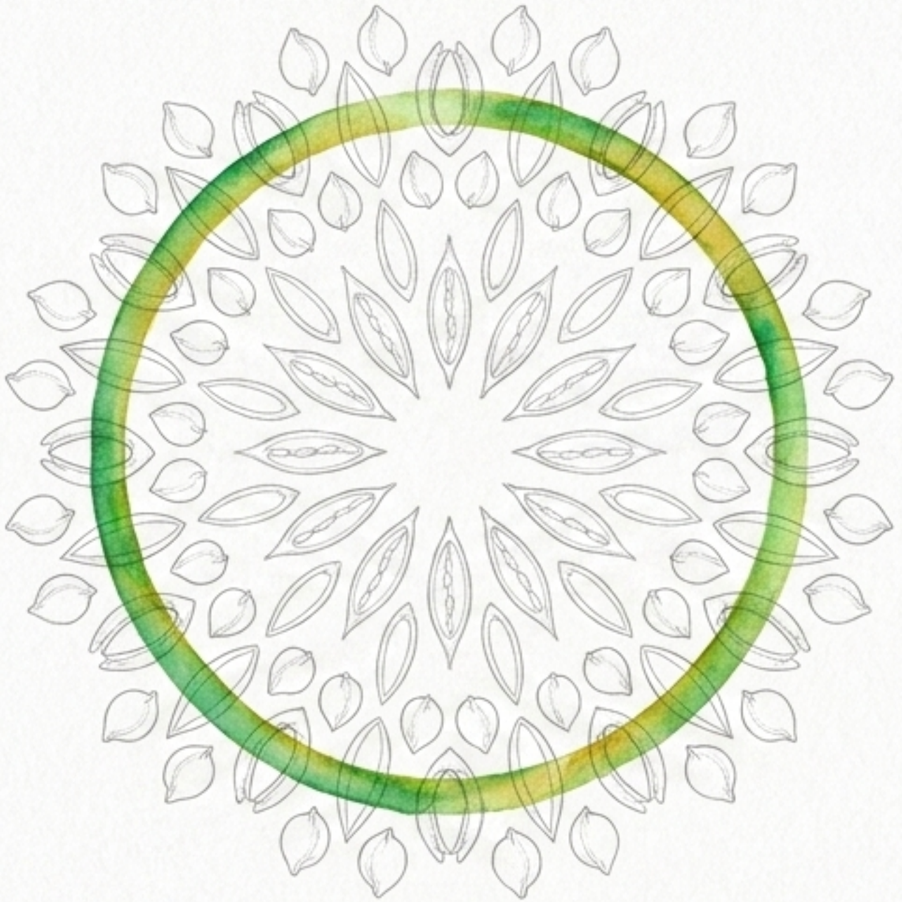
A Time Capsule from 8,000 Years of Agricultural History



The seed is not just a plant part; it is a self-contained message from the past.
It carries the precise evolutionary blueprints of its ancestors.
Its singular mission: to ensure that the living cycle of the farm never stops.

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